09/763,324

(FILE 'HOME' ENTERED AT 16:00:18 ON 19 MAY 2002)

FILE 'CAPLUS, BIOSIS, MEDLINE' ENTERED AT 16:00:48 ON 19 MAY 2002

L1 8 S CHITOSAN? AND HOMOGENE? AND (ENZYME? OR TYROSINASE OR PHENOL(

L2 5 DUP REM L1 (3 DUPLICATES REMOVED)

=

FILE 'CAPLUS' ENTERED AT 16:00:48 ON 19 MAY 2002

FILE 'BIOSIS' ENTERED AT 16:00:48 ON 19 MAY 2002

FILE 'MEDLINE' ENTERED AT 16:00:48 ON 19 MAY 2002

=> s chitosan? and homogene? and (enzyme? or tyrosinase or phenol(3a)oxidase? or polyphenol(3a)oxidase?) and phenol?
OR IS NOT A RECOGNIZED COMMAND
The previous command name entered was not recognized by the system.
For a list of commands available to you in the current file, enter
"HELP COMMANDS" at an arrow prompt (=>).

=> s chitosan? and homogene? and (enzyme? or tyrosinase or phenol(3a)oxidase? or polyphenol(3a)oxidase?) and phenol?
L1 8 CHITOSAN? AND HOMOGENE? AND (ENZYME? OR TYROSINASE OR PHENOL(3A) OXIDASE? OR POLYPHENOL(3A) OXIDASE?) AND PHENOL?

=> dup rem l1
PROCESSING COMPLETED FOR L1
L2 5 DUP REM L1 (3 DUPLICATES REMOVED)

=> d l2 abs ibib kwic 1-5

L2 ANSWER 1 OF 5 CAPLUS COPYRIGHT 2002 ACS
AB A variety of crosslinked polymers exist in nature and crosslinking confers important functional properties to biomaterials. In nature, crosslinking is generally achieved by the enzymic conversion of **phenols** into reactive intermediates (e.g. quinones or free radicals) that undergo subsequent non-enzymic reactions. Although enzymic crosslinking reactions offer interesting opportunities for conferring functionality, it has been difficult to control the poorly characterized non-enzymic reactions. We report the use of combinatorial approaches to learn how reactions of enzymically-generated quinones can be exploited for polysaccharide crosslinking and for the coupling of proteins to polysaccharides. Specifically we used **tyrosinase** to convert natural **phenols** into reactive quinones and examd. the crosslinking of the amino-polysaccharide **chitosan** and the coupling of **chitosan** to various proteins. In studies on polymer crosslinking we performed **homogeneous** reactions and examd. various **phenols** and reaction conditions. Screening was based on a rapid method to characterize the mech. properties of the enzymically crosslinked **chitosan** gels. For **chitosan**-protein coupling we used heterogeneous conditions and screened various **phenols** and reaction conditions to identify conditions that coupled protein to **chitosan** films while maintaining biol. activity.
ACCESSION NUMBER: 2001:197377 CAPLUS
TITLE: Combinatorial approach to biopolymer coupling and crosslinking
AUTHOR(S): Payne, Gregory F.; Chen, Tianhong; Vazquez-Duhalt, Rafael; Bentley, William E.; Smith, Paul J.
CORPORATE SOURCE: Center for Agricultural Biotechnology, University of Maryland, College Park, MD, 20742-4450, USA

SOURCE: Abstr. Pap. - Am. Chem. Soc. (2001), 221st, BIOT-070
CODEN: ACSRAL; ISSN: 0065-7727
PUBLISHER: American Chemical Society
DOCUMENT TYPE: Journal; Meeting Abstract
LANGUAGE: English

AB A variety of crosslinked polymers exist in nature and crosslinking confers important functional properties to biomaterials. In nature, crosslinking is generally achieved by the enzymic conversion of **phenols** into reactive intermediates (e.g. quinones or free radicals) that undergo subsequent non-enzymic reactions. Although enzymic crosslinking reactions offer interesting opportunities for conferring functionality, it has been difficult to control the poorly characterized non-enzymic reactions. We report the use of combinatorial approaches to learn how reactions of enzymically-generated quinones can be exploited for polysaccharide crosslinking and for the coupling of proteins to polysaccharides. Specifically we used **tyrosinase** to convert natural **phenols** into reactive quinones and examd. the crosslinking of the amino-polysaccharide **chitosan** and the coupling of **chitosan** to various proteins. In studies on polymer crosslinking we performed **homogeneous** reactions and examd. various **phenols** and reaction conditions. Screening was based on a rapid method to characterize the mech. properties of the enzymically crosslinked **chitosan** gels. For **chitosan**-protein coupling we used heterogeneous conditions and screened various **phenols** and reaction conditions to identify conditions that coupled protein to **chitosan** films while maintaining biol. activity.

L2 ANSWER 2 OF 5 CAPLUS COPYRIGHT 2002 ACS

AB A **homogeneous**-phase **enzyme**-catalyzed process for producing modified **chitosan** polymers or oligomers comprises reacting an **enzyme**, e.g., **tyrosinase**, with a **phenolic** substrate, e.g., chlorogenic acid, in the presence of a **chitosan** polymer or oligomer. The modified **chitosan** polymers or oligomers produced by the novel processes, in particular those having useful functional properties, e.g., base soly. and/or high viscosity are also claimed.

ACCESSION NUMBER: 2000:144914 CAPLUS
DOCUMENT NUMBER: 132:182264
TITLE: Modified **chitosan** polymers and enzymic methods for their production
INVENTOR(S): Kumar, Guneet; Payne, Gregory F.
PATENT ASSIGNEE(S): USA
SOURCE: PCT Int. Appl., 47 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2000011038	A1	20000302	WO 1999-US19106	19990820

W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

AU 9957814 A1 20000314 AU 1999-57814 19990820

EP 1137673 A1 20011004 EP 1999-945134 19990820

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO

PRIORITY APPLN. INFO.: US 1998-97709P P 19980821

WO 1999-US19106 W 19990820

REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Modified **chitosan** polymers and enzymic methods for their production

AB A **homogeneous**-phase **enzyme**-catalyzed process for producing modified **chitosan** polymers or oligomers comprises reacting an **enzyme**, e.g., **tyrosinase**, with a **phenolic** substrate, e.g., chlorogenic acid, in the presence of a **chitosan** polymer or oligomer. The modified **chitosan** polymers or oligomers produced by the novel processes, in particular those having useful functional properties, e.g., base soly. and/or high viscosity are also claimed.

ST **chitosan** reaction oxidized **phenol enzyme** oxidant; **tyrosinase** oxygen oxidn chlorogenic acid **chitosan** modification

IT Oxidation
(enzymic, of **phenols**; enzymic methods for the manuf. of **chitosan** polymers modified with oxidized **phenols**)

IT **Phenols**, preparation
RL: IMF (Industrial manufacture); PREP (Preparation)
(reaction products; enzymic methods for the manuf. of **chitosan** polymers modified with oxidized **phenols**)

IT 9002-10-2, **Tyrosinase**
RL: BPR (Biological process); BSU (Biological study, unclassified); BIOL (Biological study); PROC (Process)
(enzymic methods for the manuf. of **chitosan** polymers modified with oxidized **phenols**)

IT 51-61-6DP, Dopamine, oxidized, reaction products with **chitosan** 106-44-5DP, p-Cresol, oxidized, reaction products with **chitosan** 120-80-9DP, Catechol, oxidized, reaction products with **chitosan** 327-97-9DP, Chlorogenic acid, oxidized, reaction products with **chitosan** 9012-76-4DP, **Chitosan**, reaction products with oxidized **phenols**
RL: IMF (Industrial manufacture); PREP (Preparation)
(enzymic methods for the manuf. of **chitosan** polymers modified with oxidized **phenols**)

IT 7782-44-7, Oxygen, uses
RL: NUU (Other use, unclassified); USES (Uses)
(enzymic methods for the manuf. of **chitosan** polymers modified with oxidized **phenols**)

L2 ANSWER 3 OF 5 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 1

AB An enzymic method to graft hexyloxyphenol onto the biopolymer **chitosan** was studied. The method employs **tyrosinase** to convert the **phenol** into a reactive o-quinone, which undergoes subsequent nonenzymic reaction with **chitosan**. Reactions were conducted under heterogeneous conditions using **chitosan** films and also under **homogeneous** conditions using aq. methanolic mixts. capable of dissolving both hexyloxyphenol and **chitosan**.

Tyrosinase was shown to catalyze the oxidn. of hexyloxyphenol in such aq. methanolic solns. Chem. evidence for covalent grafting onto **chitosan** was provided by three independent spectroscopic approaches. Specifically, enzymic modification resulted in (1) the appearance of broad absorbance in the 350-nm region of the UV/vis spectra for **chitosan** films; (2) changes in the NH bending and stretching regions of **chitosan**'s IR spectra; and (3) a base-sol. material with 1H-NMR signals characteristic of both **chitosan** and the alkyl groups of hexyloxyphenol. Hexyloxyphenol modification resulted in dramatic changes in **chitosan**'s functional properties. On the basis of contact angle measurements, heterogeneous modification of a **chitosan** film yielded a hydrophobic surface. **Homogeneously** modified **chitosan** offered rheol. properties characteristic of assocg. water-sol. polymers.

ACCESSION NUMBER: 2000:816746 CAPLUS
DOCUMENT NUMBER: 134:99633
TITLE: Enzymatic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheological properties
AUTHOR(S): Chen, Tianhong; Kumar, Guneet; Harris, Michael T.; Smith, Paul J.; Payne, Gregory F.
CORPORATE SOURCE: Center for Agricultural Biotechnology, University of Maryland, College Park, MD, 20742, USA
SOURCE: Biotechnology and Bioengineering (2000), 70(5), 564-573
CODEN: BIBIAU; ISSN: 0006-3592
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 56 THERE ARE 56 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Enzymatic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheological properties

AB An enzymic method to graft hexyloxyphenol onto the biopolymer **chitosan** was studied. The method employs **tyrosinase** to convert the **phenol** into a reactive o-quinone, which undergoes subsequent nonenzymic reaction with **chitosan**. Reactions were conducted under heterogeneous conditions using **chitosan** films and also under **homogeneous** conditions using aq. methanolic mixts. capable of dissolving both hexyloxyphenol and **chitosan**. **Tyrosinase** was shown to catalyze the oxidn. of hexyloxyphenol in such aq. methanolic solns. Chem. evidence for covalent grafting onto **chitosan** was provided by three independent spectroscopic approaches. Specifically, enzymic modification resulted in (1) the appearance of broad absorbance in the 350-nm region of the UV/vis spectra for **chitosan** films; (2) changes in the NH bending and stretching regions of **chitosan**'s IR spectra; and (3) a base-sol. material with 1H-NMR signals characteristic of both **chitosan** and the alkyl groups of hexyloxyphenol. Hexyloxyphenol modification resulted in dramatic changes in **chitosan**'s functional properties. On the basis of contact angle measurements, heterogeneous modification of a **chitosan** film yielded a hydrophobic surface. **Homogeneously** modified **chitosan** offered rheol. properties characteristic of assocg. water-sol. polymers.

ST **tyrosinase** grafting hexyloxyphenol **chitosan**

IT Contact angle
Viscosity
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter

surface and rheol. properties)

IT Oxidation
(enzymic; enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT Polymers, preparation
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); PRP (Properties); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation)
(graft; enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT 9012-76-4DP, **Chitosan**, graft copolymer with hexyloxyphenol
RL: BMF (Bioindustrial manufacture); BPN (Biosynthetic preparation); PRP (Properties); PUR (Purification or recovery); BIOL (Biological study); PREP (Preparation)
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT 9002-10-2, **Tyrosinase**
RL: BPR (Biological process); BSU (Biological study, unclassified); CAT (Catalyst use); BIOL (Biological study); PROC (Process); USES (Uses)
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT 622-62-8 9012-76-4, **Chitosan** 18979-55-0, 4-n-Hexyloxyphenol 26638-03-9, Methoxyphenol
RL: BPR (Biological process); BSU (Biological study, unclassified); RCT (Reactant); BIOL (Biological study); PROC (Process); RACT (Reactant or reagent)
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT 320401-59-0
RL: BSU (Biological study, unclassified); MFM (Metabolic formation); BIOL (Biological study); FORM (Formation, nonpreparative)
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

IT 69818-23-1 320401-57-8
RL: BSU (Biological study, unclassified); MFM (Metabolic formation); RCT (Reactant); BIOL (Biological study); FORM (Formation, nonpreparative); RACT (Reactant or reagent)
(enzymic grafting of hexyloxyphenol onto **chitosan** to alter surface and rheol. properties)

L2 ANSWER 4 OF 5 CAPLUS COPYRIGHT 2002 ACS

AB It was obsd. that addn. of **tyrosinase** and the simple **phenol**, p-cresol, to semi-dil. solns. of **chitosan** (I) resulted in the in situ formation of I gels. Specifically, **homogeneous** reactions were conducted with I solns. (0.32 w/v %) at pH near 6.0 and with cresol levels of 0.6 molar equiv (relative to I amino groups). Oscillatory shear measurements showed that the enzymic reaction resulted in large increases in the complex viscosity (.eta.*) and storage and loss moduli (G' and G''). These dynamic measurements indicated that the enzymic reaction resulted in the conversion of the nearly Newtonian semi-dil. I solns. into gels. The rheol. behavior of these enzymically-generated gels was compared to the behavior of acidic I solns. and to solns. contg. xanthan gum.

ACCESSION NUMBER: 2000:450035 CAPLUS
DOCUMENT NUMBER: 134:6082
TITLE: In situ **chitosan** gelation using the **enzyme tyrosinase**
AUTHOR(S): Kumar, G.; Bristow, J. F.; Smith, P. J.; Payne, G. F.

CORPORATE SOURCE: Center for Agricultural Biotechnology, Univ. Maryland, College Park, MD, 20742, USA
SOURCE: Advances in Chitin Science (2000), 4(EUCHIS'99), 345-348
CODEN: ACSCFF
PUBLISHER: Universitaet Potsdam, Universitaetsbibliothek
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 18 THERE ARE 18 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI In situ **chitosan** gelation using the **enzyme tyrosinase**

AB It was obsd. that addn. of **tyrosinase** and the simple **phenol**, p-cresol, to semi-dil. solns. of **chitosan** (I) resulted in the in situ formation of I gels. Specifically, **homogeneous** reactions were conducted with I solns. (0.32 w/v %) at pH near 6.0 and with cresol levels of 0.6 molar equiv (relative to I amino groups). Oscillatory shear measurements showed that the enzymic reaction resulted in large increases in the complex viscosity (.eta.*) and storage and loss moduli (G' and G''). These dynamic measurements indicated that the enzymic reaction resulted in the conversion of the nearly Newtonian semi-dil. I solns. into gels. The rheol. behavior of these enzymically-generated gels was compared to the behavior of acidic I solns. and to solns. contg. xanthan gum.

ST **tyrosinase enzyme** cresol in situ gelation **chitosan** soln; mech loss viscoelasticity viscosity **chitosan** soln gelation cresol **enzyme**

IT Gelation
Mechanical loss
Viscoelasticity
Viscosity
(in situ **chitosan** soln. gelation using **tyrosinase enzyme** and p-cresol)

IT **Enzymes**, uses
RL: NUU (Other use, unclassified); USES (Uses)
(**tyrosinase**; in situ **chitosan** soln. gelation using **tyrosinase enzyme** and p-cresol)

IT 106-44-5, p-Cresol, uses 9002-10-2, **Tyrosinase**
RL: NUU (Other use, unclassified); USES (Uses)
(in situ **chitosan** soln. gelation using **tyrosinase enzyme** and p-cresol)

IT 9012-76-4, **Chitosan**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(in situ **chitosan** soln. gelation using **tyrosinase enzyme** and p-cresol)

L2 ANSWER 5 OF 5 CAPLUS COPYRIGHT 2002 ACS DUPLICATE 2

AB **Chitosan** (I) is a natural biopolymer whose rich amine functionality confers water soly. at low pH. At higher pH's (>6.5), the amines are deprotonated, and I is insol. To attain water soly. under basic conditions the hydrophilic compd. chlorogenic acid (II) was enzymically grafted onto I. Despite its name, II is a non-chlorinated **phenolic** natural product that has carboxylic acid and OH functionality. The **enzyme** used was **tyrosinase**, which converts a wide range of **phenolic** substrates into electrophilic o-quinones. The o-quinones are freely diffusible and can undergo reaction with the nucleophilic amino groups of I. Using slightly acidic conditions

(pH = 6.0), it was possible to modify I under **homogeneous** conditions. When the amt. of II used in the modification reaction was >30% relative to the I amino groups, the modified I was obsd. to be sol. under both acidic and basic conditions, and to have a pH window of insoly. at near neutral pH. Proton NMR spectra confirmed that I was chem. modified, although the degree of modification was low.

ACCESSION NUMBER: 1999:131727 CAPLUS
DOCUMENT NUMBER: 130:239087
TITLE: Enzymic grafting of a natural product onto **chitosan** to confer water solubility under basic conditions
AUTHOR(S): Kumar, Guneet; Smith, Paul J.; Payne, Gregory F.
CORPORATE SOURCE: Center for Agricultural Biotechnology, University of Maryland, College Park, MD, 20742, USA
SOURCE: Biotechnology and Bioengineering (1999), 63(2), 154-165
CODEN: BIBIAU; ISSN: 0006-3592
PUBLISHER: John Wiley & Sons, Inc.
DOCUMENT TYPE: Journal
LANGUAGE: English
REFERENCE COUNT: 56 THERE ARE 56 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Enzymic grafting of a natural product onto **chitosan** to confer water solubility under basic conditions

AB **Chitosan** (I) is a natural biopolymer whose rich amine functionality confers water soly. at low pH. At higher pH's (>6.5), the amines are deprotonated, and I is insol. To attain water soly. under basic conditions the hydrophilic compd. chlorogenic acid (II) was enzymically grafted onto I. Despite its name, II is a non-chlorinated **phenolic** natural product that has carboxylic acid and OH functionality. The **enzyme** used was **tyrosinase**, which converts a wide range of **phenolic** substrates into electrophilic o-quinones. The o-quinones are freely diffusible and can undergo reaction with the nucleophilic amino groups of I. Using slightly acidic conditions (pH = 6.0), it was possible to modify I under **homogeneous** conditions. When the amt. of II used in the modification reaction was >30% relative to the I amino groups, the modified I was obsd. to be sol. under both acidic and basic conditions, and to have a pH window of insoly. at near neutral pH. Proton NMR spectra confirmed that I was chem. modified, although the degree of modification was low.

ST chlorogenic acid grafting **chitosan** soly **tyrosinase** **enzyme** catalyst

IT Solubility
(alk.; enzymically catalyzed grafting of natural products onto **chitosan** to confer water soly. under alk. conditions)

IT **Enzymes**, uses
RL: CAT (Catalyst use); USES (Uses)
(enzymically catalyzed grafting of natural products onto **chitosan** to confer water soly. under alk. conditions)

IT Polymerization
Polymerization catalysts
(graft; enzymically catalyzed grafting of natural products onto **chitosan** to confer water soly. under alk. conditions)

IT 9002-10-2, **Tyrosinase**
RL: CAT (Catalyst use); USES (Uses)
(enzymically catalyzed grafting of natural products onto **chitosan** to confer water soly. under alk. conditions)

IT 327-97-9, Chlorogenic acid 9012-76-4, **Chitosan**

RL: RCT (Reactant); RACT (Reactant or reagent)
(enzymically catalyzed grafting of natural products onto **chitosan** to confer water soly. under alk. conditions)

L Number	Hits	Search Text	DB	Time stamp
1	12	chitosan$2 same (polymer$2 or copolymer$2) same viscosity same (cps! or centipoise$2 or poise$2)	USPAT; US-PGPUB	2002/05/19 15:46